



## Fact Sheet:

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### REMR MANAGEMENT SYSTEM FOR CONCRETE NAVIGATION LOCK MONOLITHS

#### The Problem

The U.S. Army Corps of Engineers operates approximately 270 navigation lock structures, most of which are constructed of reinforced concrete monoliths. Many of these structures require, or will require, significant repairs to ensure safe and efficient operations. Those responsible for maintenance and repair (M&R) of these navigation lock monoliths need a comprehensive decision support tool to assist them with project prioritization and efficient allocation of scarce funds.

#### The Technology

To help managers involved with M&R project planning and budgeting for concrete navigation lock structures, the U.S. Army Construction Engineering Research Laboratories (CERL) has developed a Repair, Evaluation, Maintenance, and Rehabilitation (REMR) Management System (see [CERL Fact Sheet FL 19 REMR Management Systems for Civil Works Structures](#)). A major component system of this REMR Management System is LOCKWALL. This microcomputer-based application addresses the REMR aspects of concrete navigation lock monoliths by performing data base administration, calculations, and report generation. The following are fundamental pieces of LOCKWALL:

**User interface.** LOCKWALL runs in an IBM-AT compatible, DOS environment, and requires 640K free RAM. The user interface is menu driven, allowing even novice personal computer users to use the program easily. Condition assessment data is entered into the program just as it was entered into the inspection form in the field. The user fills in the blanks or checks the appropriate response when prompted by the program.

**Inventory.** LOCKWALL houses an inventory of all waterway systems and navigation lock structures within any given Division. Data pertinent to each structure, such as owner/operator, construction date, lock width, lock length, lock lift, etc., are stored.

**Condition assessment.** The condition inspection data is gathered by visual observation and performance of simple measurements. The inspector catalogs the location and extent of concrete cracking, loss of volume, and deterioration. Other forms of distress such as exposed steel, leaks, stains, deposits, and missing or damaged armor are noted. The data are accepted and stored by LOCKWALL, which uses an algorithm to produce a condition index (CI) (see CERL Fact Sheet [FL 12--The Condition Index](#)) for each monolith inspected. The CI represents the condition of the concrete in each monolith on a scale of 0 to 100, with 100 reflecting an "as built" condition. A CI under 40 indicates a "poor" condition. Great care is taken in the development of the algorithm and inspection procedure to ensure that the results are consistent and repeatable. It is such uniformity that allows an objective comparison of the condition of concrete in one structure to that of another.

**M&R alternatives.** Information regarding M&R operations for concrete lockwalls has been gathered and stored in the LOCKWALL program. The information exists in the form of American Standard Code for Information Interchange (ASCII) files. These ASCII files can be sent to the PC monitor for viewing or to the printer for hard copy. These files do not interact with the CI database in any way. They are strictly for information, to help the user research and determine proper maintenance strategies for a given set of distresses.

**Life cycle costs.** LOCKWALL has a life cycle costs analysis (LCCA) utility that can be directly tied into the CI inspection database. In terms of LCCA maintenance planning, all LCCAs require a standard input: inflation rate, interest rate, required life of overall maintenance plan, beginning year of maintenance plan, individual maintenance activity description, cost of individual maintenance activity, expected life of individual maintenance activity, and beginning year of individual maintenance activity. The standard output is a financial schedule showing the required dollars and present worth of such dollars to implement each individual maintenance activity. Total cost and total present worth for the overall plan are also presented. Benefits/Savings

This computerized REMR Management System provides procedures for performing condition surveys, consistent and quantitative condition assessment, and data base management. Combined with economic analyses, these procedures allow efficient M&R budget planning through the evaluation of current condition and comparison of various M&R alternatives based on life cycle costs. The ultimate goal is to achieve the best possible condition for concrete navigation lock structures at any funding level.

### **Status**

The REMR Management System for concrete navigation lock monoliths has been tested, validated, and implemented throughout the U.S. Army Corps of Engineers since 1989. Training sessions for Corps personnel have been completed and the program is undergoing updates and revisions as necessary.

The most current REMR software is available on the Internet at

<http://www.cecer.army.mil/fl/remr/remr.html>

### **Point of Contact**

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Visit the CERL home page at <http://www.cecer.army.mil>

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